International Seminar on Small Hydro Power Held in India

"International Seminar on Small Hydro Power" was held in Trivandrum, Kerala, India on 12-14 December 2007. It was Organized by Government of Kerala, UNIDO Regional Centre for Small Hydro Power and Energy Management Centre Kerala. This conference has been supported by UNIDO, Ministry of New & Renewable Energy Sources of India, International Network on Small Hydro Power (IN-SHP), Agency for Non-Conventional Energy and Rural Technology (ANERT), Indian Renewable Energy Agency (IREDA) & Kerala State Electricity Board. Main Objectives of the Conference were:

- To exchange views on small hydro power development in the region and its potential for meeting the current and future rural electrification needs,
- To study, through case histories, the various models of small hydro power development in the region,
- To examine the potential for development of Pico, Micro, Mini and Small hydropower development in the countries of the region,
- To take note of the financing options and policies for small hydro power development in the region,
- To explore the opportunities for local user participation from concept to completion of small hydro projects,
- To identify Action Programs in each of the participating countries and develop a strategy for accelerated development of small hydro power as a means of sustainable development with the involvement of UNIDO, UNDP and bilateral or multilateral agencies. ■

Source: UNIDO

The 3rd Hydro Power for Today Forum Held in Hangzhou, China

Co-sponsored by IN-SHP, IEA, and UNIDO, the 3rd Hydropower for Today forum was held on 12th June, 2007 in Hangzhou, and was successfully concluded on 13th June, 2007. The focus of this forum was on SHP in Africa and Asia. The Forum had 188 delegates: 66 from 26 countries abroad and 122 from China.

During the period of 2 days, an extensive array of presentations were made. The Forum after discussing various problems faced by most of the developing countries for the speedy development of the most urgent SHP development, has looked at various approaches to their solutions form Asia, Africa, Latin America and the Europe and exchanged views on how best the needy regions in Asia and Africa could be best served by the most appropriate small hydro power solutions.

The Forum had the benefit of 27 learned presentations from researchers and practitioners of SHP from all over the world in 7 technical sessions, chaired by an International Presidium for each session.

The delegates were given insights into some interesting new technology developments like the further improvements in the updraft free exit flow turbine, giving hope of a weight reduction to one third of the normal turbines, cost reduction of 30-60% over conventional axial flow turbines and making it environmentally and fish friendly, avoiding the costly draft tube too. We have, of course, to wait for its commercialization in the near future. The other technological innovation reported was the studies conducted simultaneously in China and Finland on performance prediction of Bulb turbines by flow simulation and bringing prediction and reality to closer distance.

The "Light-up Rural Africa" Programme has been officially kicked off at this Forum, and all the countries, the People's Republic of China and IN-SHP all declared their intention to actively participate in this programme to promote SHP development in African rural areas. ■

Source: IN-SHP

ESHA and the WFD

European Small Hydropower Association(ESHA) attended two meetings on the Water Framework Directive (WFD) that took place in Brussels. The first meeting, concerned with the Drafting Group on Environmental Objectives and Exemptions, took place on 10 September 2007 where the second draft version of the paper "Exemptions to the Environmental Objectives under the WFD, Article 4.4 - 4.6" was discussed.

The meeting of the Working Group 2A on Ecological Status (ECOSTAT) took place from 8-9 October 2007, where inter-calibration exercises, amongst others, were discussed.

The latest documentation regarding the WFD implementation can be summarized as follows:

◆ Key conclusions in June 2007 CIS Workshop "WFD & Hydropower". In June 2007, the hydro-morphology group met to discuss the different aspects of the WFD and Hydropower.

◆ Floods Directive adopted. The Directive on the assessment and management of Floods was adopted on 18 September 2007 and will enter into force 20 days after its publication in the Official Journal.

◆ Study on costs and benefits of the WFD The study on "Costs and benefits related to the implementation of the WFD" has been finalised.

◆ ECOSTAT – Documents on samples and tests to be performed on inter-calibration exercises for rivers have now been documented.■

Source: ESHA

Two New Studies from the World Energy Council

The WEC has published two studies on Energy and Climate Change this year.

The study, entitled "Energy and Climate Change", draws on the collective experience and resources of energy professionals worldwide. It has looked in detail at the impact of existing climate change measures and how effective they have been in promoting sustainable development, using the criteria of the three "As" – accessibility (to affordable energy); acceptability (of the energy sources used, particularly in environmental terms); and availability (how secure and reliable are those sources?).

The second publication, "2007 Global Energy Survey", focuses on the topic "Tackling the Three Ss: Sustainability, Security and Strategy" and is based on interviews with more than 50 senior executives from the world's leading energy companies and their strategic suppliers by Korn/Ferry International.■

For more details, see http://www.setatwork.eu/news/n017.htm

Source: T@W

ESHA Present at ENERGAIA, 6-8 December, Montpellier, France

ESHA represented during the ENERGAIA International Renewable Energies Exhibition held in France from 6-8 December 2007. ESHA took part in the "Roundtable on Sustainable Hydropower – the way forward" which took place on the afternoon of 7 December 2007. This roundtable is organised in the framework of the IEE SHERPA Project and will focus on issues such as ISO 14001 certification for SHP producers – an innovative approach, sustainability guides for SHP, public image of SHP, new approaches to environmental and social engineering, as well as spatial planning. Innovative products will also be presented. ESHA also represented the Small Hydropower sector during the RESTMAC Roundtable held on 6 December 2007 entitled "Europe and Renewable Energies: EU Renewable Energy Policy & Market Development – The Renewable Energy Policy Roadmap and how to create a scale up effect" together with the other renewable energy sectors.■

Source: ESHA

Vice Minister Hu Siyi Inspected HRC

On June 12, Vice Minister of Ministry of Water Resources (MWR) Mr. Hu Siyi inspected HRC, accompanied by Mr. Tian Zhongxing, Director of Bureau of Rural Electrification, MWR, Mr. Liu Zhiguang, Deputy Director of Department of International Cooperation, Science and Technology, MWR, as well as the Division Chiefs Mr. Wu Hongwei, Mr. Jinhai and Mr. Zhu Shoufeng, etc.

Mr. Zhang Jianyun, President of Nangjing Hydrualic Research Institute, extended warm welcome to Vice Minister Hu and the other leaders from the MWR, and expressed high appreciation to MWR for their great concern and continuous support to HRC.

After listening to the Work Report delivered by Dr. Chen Shengshui, Director of HRC, Vice Minister Hu highly evaluated HRC's achievements, which had been scored under the correct leadership of NHRI and based on the great support of related departments and bureaus of MWR as well as the joint effort of HRC staff. Moreover, Vice Minister Hu made an important speech on HRC's major work of the next stage. He required that HRC should put emphasis on rural hydropower development, take full advantage of its own superiority to participate in the missions related to rural hydropower at the ministry and state level, such as the planning on rural hydropower development, the research on the relevant principles and policies, the issues on rural hydropower management and technology progress, and the establishment of technical standards concerned, etc. And great attention should be paid to the current restraining factors to rural hydropower development, inclusive of the relocation and ecological environment problems caused by hydropower exploitation. Having the long-term view in mind, we should think about the self-sustainable development for the institute in the "Post Hydropower Period". Vice Minister Hu also made clarifications in response to some issues concerned by HRC staff, and expressed that he would continuously pay attention to the construction of HRC's scientific research platform, and meanwhile, HRC was demanded to make full preparation and create condition actively.

On behalf of Bureau of Rural Electrification and Department of International Cooperation, Science and Technology, Director Tian and Director Liu respectively put forward the concrete requirements on HRC's future development.

The meeting was presided by President Zhang Jianyuan, with the attendance of the HRC leaders, division chiefs, senior engineers and some retired leaders.■

Situation and tasks of China's waterpower resources management and rural hydropower development in 2007

The auther of this article Mr. Tian Zhongxing is the Director of Rural Hydropower and Development of Electrification Bureau under the Ministry of Water Resources. This article is published in the magazine <China Waterpower and Electrification> 2007 No.1/2 in Chinese. The following is its excerpt.

1.Situation of waterpower resources management and rural electrification

Rural hydropower keeps rapid development. By the end of 2006, the total installed capacity reached 50GW, which occupied 37% of total hydropower capacity in the country. Thus, rural hydropower has formed an important part of state power supply.

By now, <"Eleventh Five-year" and 2020 plan of national hydropower-based rural electrification> has been prepared and approved. Another 400 counties will further be chosen to carry out the rural electrification construction.

The scope and scale of the project "Small Hydropower Replacing Firewood" has been expanded. <2006-2008 plan for the ecological protection program to replace firewood with small hydropower.> has been approved, which covers 21 provinces, 81 project areas and 636, 000 population with a planned installed capacity of 150,000kW, and will also drive the rural infrastructure construction.

Waterpower resources management has gained initial success. The administrative function of hydroenergy resources for water authorities of more than 10 provinces have been identified and related policies and rules issued. Exploitation right of waterpower resources should be obtained through tender or transferred by payment. The collected capital from the resources should be used for river treatment, ecological compensation and benefit conflict disposal, etc.

Order of rural hydropower construction management gradually turns better. Banning of irregular exploitation and clearing of illegal hydropower stations continue. Some policy documents are released, such as <Issues on Enforcing Management of Rural Hydropower Construction> and <Environment Protection Management Issues on Rural Hydropower Construction>. These documents have identified concrete requirements of rural hydropower station planning, design, government approval, construction, check and examination, security, environment protection, etc.

2. Challenge and countermeasure

We have to face the challenge of fulfilling the target of "Eleventh Five –year Plan" of rural hydropower development, because there are still some problems which affect the development. The first problem is that we have confused the hydroenergy resources management with hydropower construction management, which caused the absence of resources management . The second problem is that central government financial assistance is not enough for those poor areas. The third problem is that rural hydropower legislation has no substantial progress. The fourth problem is that self-construction of rural hydropower sector needs to be strengthened.

To solve all above problems, premier Wen Jiabao has pointed out, "small hydropower exploitation should follow correct direction and policy, combine with peasant's benefit, local development, environment protection and ecological construction, and take a way of scientific, well-ordered and sustainable development." Therefore, we should promote the development of "SHP Replacing Firewood Program", pay more attention to integrated benefit of SHP, reduce the negative environmental impact as far as possible, maintain river health, put more importance on farmer's benefit, increase their income and improve their living condition.

3.Tasks of hydroenergy resources management and rural hydropower

"Eleventh Five-Year Plan" is a period of strategic opportunity for rural hydropower development. In 2007, rural hydropower development should be continued and strengthened according to the sprit of the central government's No.1 document and instruction of Premier Wen Jiabao. Waterpower resources is an important part of water resources. As water administration department, we should emphasize and firmly hold on to the strengthening of hydroenergy management, banning of disorderly exploitation, expediting legislation of hydroenergy resources and rural hydropower, solid advance of SHP-based rural electrification and program of SHP replacing firewood and improvement of administration capability for the whole section..

We will take action for pushing the waterpower resources management. Gradually smooth the institutional system of management, setting up the system of paid exploitation of water power resources and market-oriented distribution. Take steps to set up waterpower resources sector in river basin authorities, enforcing the waterpower resources management and planning, combining the river basin integrated planning, start the planning for river basin waterpower. Continue to carry out the national waterpower resources investigation and evaluation.

The target of rural hydropower construction for 2007 is to install new capacity of more than 6GW, and keep about 20GW under construction; to improve national waterpower management system, to gradually set up sound operation mechanism of waterpower exploitation and protection; to start the legislation of <Statute on Rural Hydropower> and <Statute of Waterpower Resources Management>, to coordinate with other related power legislation, and to release adaptable policy of <Renewable Energy Law> for small hydropower. We should firmly carry out the "Eleventh Five-year Plan" for construction of counties of hydropower rural electrification, and start the demonstrative projects of expanded "SHP Replacing Firewood". Continue to rule the rural hydropower construction order, promote the level of rural hydropower security and management, and continue to push the rural hydropower modernization.

continued on page 7

National Foreign Aid Training Conference Held in Beijing

National Foreign Aid Training Conference was held in Beijing on July 26. The conference intended to update foreign aid training according to the new situations and tasks. Altogether 260 representatives attended the conference, coming from various government ministries, including the Ministry of Commerce, Ministry of Foreign Affairs, Ministry of Finance, Ministry of Education, Ministry of Science and Technology, Ministry of Agriculture, and Ministry of Health, and local departments in charge of foreign aid affairs.

Minister Bo Xilai reviewed the achievements of foreign aid since the founding of new China. Up to 2006, China had hosted 2500 sessions of foreign aid training for 150 countries and regions, serving over 80,000 people and covering more than 150 majors in 20 training fields, such as economics, management, agriculture, health, justice, and education. Foreign aid training had helped us develop an excellent rapport with other developing countries and promote economic cooperation.

The "Foreign Aid Human Resources Coordination System", which was established with the joint efforts of different government ministries, pooled in the best resources of every ministry for closer cooperation and brought foreign aid training to a higher level, Bo said.

Foreign aid training is more than a form of international exchange and cooperation, as Minister Bo expressed, it also assumes the role of spreading Chinese culture and promoting world harmony. It is our responsibility to improve the quality of training and make sure that the countries receiving the aid can really benefit from the training program.

Vice Minister of the Ministry of Foreign Affairs Zhang Yesui confirmed the significance of foreign aid training in terms of promoting international prestige and boosting economic cooperation. He urged the better coordination between different ministries and within each ministry, in order to improve the quality of foreign aid training.

Vice Minister of the International Department of the Central Committee of CPC Chen Fengxiang, Vice-Minister of the Ministry of Education Wu Qidi, Vice Minister of the Ministry of Land and Resources Zhang Ruisheng, Vice Governors of Shanxi, Jiangsu, Zhejiang Province, and Vice Mayors of Shanghai and Chongqing attended the conference. ■

Source: website of Ministry of Commerce,

http://english.mofcom.gov.cn

Rural Hydropower Reform Seminar Held in Beijing

Rural Hydropower Reform Seminar was held in Beijing on October10 -11, 2007. Vice Minister Hu Siyi sent a special message to the seminar. He encouraged everyone to follow closely the important instructions by Premier Wen Jiabao, the concrete conditions of the rural hydropower and the document No 19 of 2007 issued by the General Department of the State Council, so as to explore the reforming approaches in agreement with the objective requirements of rural hydropower development. He hoped that the rural hydropower could better serve the rural areas, the agriculture and the farmers, promoting environmental protection, ecological improvement and the harmonious development of water resources.

The seminar was chaired by Mr.Liu Zhongmin, the Deputy Director general, Bureau of Rural Hydropower & Electrification. Mr. Tian Zhongxing, Director General, Bureau of Rural Hydropower & Electrification gave a conclusion.■

South-South Cooperation Seminar Held at Hangzhou

Seminar on aid to foreign countries in the new situation and South-South cooperation schemes was held in 4-5 Nov. at Hangzhou, sponsored by China International Center of Economic & Technical Exchange. The topics of the seminar included regional cooperation, how to cooperate with ASEAN and African countries etc. Over 50 representatives from around 30 organizations in China were present. Several HRC's staff attended the seminar and made recommendations on ways of developing more international cooperation by means of South-South cooperation. ■

Vice Minister Ms Zhou Ying Inspected HRC

on 26th Jan, 2008 Ms. Zhou Ying, vice minister of Ministry of Water Resources(MWR) braved the cold rain and snow to inspect HRC, accompanied by Ms. Liu Yaming, Director General of Personnel, Labor and Education Department, Mr. Sun Jinhua, Vice President of Nanjing Hydraulic Research Institute, as well as other leaders of NHRI Bai Wenzheng, Liu Heng, etc.. Vice Minister Ms Zhou discussed cordially with HRC leaders and some division chiefs. Mr. Chen Shengshui, Vice President of NHRI, Director of Rural Electrification Institute and Director of HRC, briefly reported on the work of 2007 and welfare of the staff to Vice Minister Ms Zhou.

After listening to the Report, Vice Minister Ms Zhou congratulated the progress HRC has made in various fields in 2007, expressed the hope that HRC's leaders and staff could make persistent efforts, put emphasis on rural hydropower development, take full advantage of its talents and profession to further explore the international and domestic markets. She hoped HRC's the work of 2008 could score even higher.

When leaving, Vice Minister Zhou urged again that the leaders of HRC could, on behalf of her, wish everyone happy new year, smooth work, good health and family happiness.■

Experts from APCAEM Visited HRC

On June 21, 2007 Dr. Joong-Wan CHO (Head / Senior Economic Affairs Officer) and Mr. Ping Chang (Senior Expert) from the United Nations Asian and Pacific Center for Agricultural Engineering and Machinery (APCAEM) paid a visit to HRC, and Ms. Cheng Xialei, Deputy Director of HRC was present to welcome. Both sides exchanged information and ideas about respective business, technology, advantage and prospective target, as well as future cooperative chance.

APCAEM is a subsidiary body/regional institution of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), which was established in Beijing, China in 2004. It is committed to enhancing environmentally sustainable agricultural and food production, applying green and modern agro-technology for the well being of producers and consumers of the agricultural/food products.■

continued from page 5

The importance of rural hydropower management is to stipulate the construction order and operation security. We should strengthen the management of every step of rural hydropower construction, and especially be strict with project technical examination, environmental impact pre-examination, standardize construction procedures, and enforce the supervision and administration of construction process. Supervision and management system for rural hydropower operation security should be improved, and classified security registration should be the necessary term for power business license. The grid of rural- hydropower- supplied areas must be continuously promoted. We should also promote the technical level of rural hydropower industry by improving the technical standard system, putting into effect the <Instruction of Rural Hydropower Modernization>. ■ (HRC)

HRC's Project has Passed Acceptance

—The project <Unmanned Automatic Controlling System for Rural Small Hydropower Stations> entrusted by the Chinese Ministry of Science & Technology and undertaken by HRC has passed the acceptance recently conducted by the Department of International Cooperation & Science-Technology, Ministry of Water Resources.

The project has improved the former unmanned automatic controlling system developed by HRC. The system has now become more reliable, economical and practical. Unmanned or fewer personnel on duty reduces the cost of operation for the SHP station.

During the implementation phase of the project, pilot stations have been set up, personnel trained, 37 sets of unmanned automatic controlling system for 16 SHP stations have been completed. Meanwhile, the equipment has been exported to Peru, Turkey, Vietnam, Mongolia and etc. The experts all believe that the project has high practical value and bright prospect for application.■

HRC's Design Institute Signed Contract with Vietnam

A technical contract <Bidding design & detailed construction design for Thai An SHP Station in Vietnam> has been signed recently between HRC's Design Institute and Thai An Hydropower Corp.

Thai An SHP Station lies near the boundary between Vietnam and China. Its preliminary work and preliminary design has been done by the First Electric Design Institute of Vietnam. The contract signed defines the follow-up designing work to be taken by HRC's Design Institute, to optimize the original designing scheme based on the preliminary design and then complete electro-mechanical and civil design for bidding, together with the detailed construction design. The project is scheduled to put into operation by the end of 2009. ■

HRC Successfully held SHP Training Workshop for Mongolia

The 15-day "SHP Training Workshop for Mongolia" was successfully concluded on April 24, 2007 in HRC. The training period was not very long, however, it has pretty substantial and practical content, which are designed and arranged specially for the administrative and technical staff from the two Mongolian hydropower stations. The training course was highly evaluated by the participants.

During the training, besides the lectures on basic theory and key technology for SHP station, the detailed case study on turbine and electrical part of Taishir Hydropower Station were made respectively. In addition, the on-site visits have been also paid to the related hydropower equipment manufacturers and hydropower stations.

At the closing ceremony, the HRC leaders gave praises to the Mongolian participants for their earnest and assiduity, and sincerely congratulated them on having achieved the fruitful results. The directors of Taishir and Durgun Hydropower Stations addressed respectively to express their heartfelt thankfulness for everything HRC had done for them, including all the professional organization and considerate arrangement. Cherishing the profound friendship between the two sides, the Mongolian friends said that they would like to explore more cooperation with HRC in future.■

French Officials Visited HRC

On July 11 afternoon, a 4-person group headed by Mr Fornage from French Development Agency (AFD) paid a visit to HRC. In the meeting, both sides introduced their own background and business scope, and explored the potential of mutual cooperation especially in the fields of SHP environment impact study, construction project appraisal, technical training etc. in earnest.

Deputy Director Mrs. Cheng Xialei, two section-chiefs respectively from International Cooperation and Science & Technology Division and Foreign Affairs & Training Division were present at the meeting. ■

HRC Research Project "SHP Sustainable Development in China" Has Been Accepted by MWR

The project "research on sustainable development of small hydropower in China" implemented by HRC has fulfilled the acceptance by Ministry of Water Resources on 24th October, 2007. The content of this research project includes five parts: technical development strategy of SHP in China, market competitiveness of SHP in China, environment impact of SHP in China, investment and financing of SHP in China, macro economy policy of SHP in China.■

HRC Research Project "Collection and Analysis of International SHP Standards" Accepted by MWR

HRC research project "Collection and Analysis of International Technical Standards for SHP" has been accepted by MWR on Sep.23rd, 2007. In the project, a large number of relevant international technical standards were collected and being compared with the Chinese corresponding ones. Measures for improving Chinese SHP standard system were also proposed.■

Verified by HRC, Shuanglongdong SHP Station Got Its First VER

Shuanglongdong SHP station got its first VER from April 2006 to April 2007, which is verified by HRC as third party. This SHP station was renovated by HRC with the new containerized equipment. With the help of HRC, the owner signed VER selling contract with foreign buyer for 4 years.■

HRC Project" Key Technique of Containerized SHP Station" Has Passed the Examination

"948" Project"key technique of containerized SHP station" has been accepted by "948" Project Administration Office of Ministry of Water Resources on 15th March, 2007. ■

2007 Training on Qualification of Hydropower Safety Supervisor Concluded

On 23rd Nov, still a warm day though already in winter, 2007 training workshop on qualification of hydropower safety supervisors was successfully concluded at the scenic city of Hangzhou. Sponsored by Bureau of Rural Hydro & Electrification, Ministry of Water Resources, the Workshop has been implemented by National Research Institute for Rural Electrification (HRC).

200 trainees across the country attended the training workshop which has been divided into two phases with a duration of 5 days each. The unified teaching material <Rural Hydropower Safety Supervisor> compiled by Bureau of Rural Hydro & Electrification, Ministry of Water Resources was adopted for the first time. Based on the teaching material, the training organizer set out the training objectives, worked out the outlines, scheduled the training arrangement and conducted a closed-book examination.

Through the training, participants had better understanding that safety dominates everything. Meanwhile, the qualification, requirement, duty and task of safety supervision are further clarified. The participants recognized further the targets, procedures and content of safety supervision. They have learnt more measures and techniques for accident prevention. The trainees returned home with bump harvest.

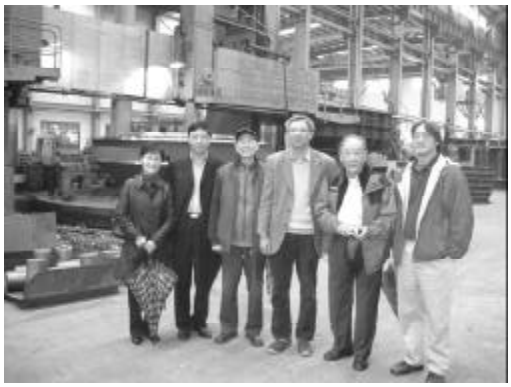
The questionnaires by the trainees show that the training effect is salient and they placed high evaluation of the training workshop. ■

Cooperative Agreements Reached Between HRC & ORENCO, U.S.A.

In 15-20 Nov 2007, Dr Tseng president of ORENCO in U.S.A together with his assistant Mr. Eddie Shiang visited HRC and discussed the cooperative projects of refurbishing Xihu Hydropower Station in Jinhua and building a SHP station at Fox River in U.S.A.

Early this year, ORENCO under support of HRC, applied for the renewable energy award from California Energy Commission for refurbishing Xihu Hydropower Station in Jinhua, which has been approved recently. Dr Tseng came to Hangzhou to make further investigation of the power station and prepare for the next phase of cooperation. Earlier, Xihu Hydropower station in Jinhua was set as the pilot hydropower station of containerized type for indigenous production developed by HRC.

Currently, the design scheme has been finished and the equipment is being manufactured. It is expected to put into commissioning next year. During the visit, Dr Tseng went to the site of Xihu Hydropower Station in Jinhua, accompanied by HRC Deputy Director Ms Cheng and HRC Honorary Director Prof. Zhu. After the visit to Jinhua Turbine Factory and a local hydropower station, Dr Tseng appreciated highly China's domestic SHP equipment and its automation technique.



During his visit, Dr Tseng introduced the SHP development in USA and discussed the technical schemes of setting up a low-head SHP station at Fox River in USA. HRC was invited to participate in the project in EPC form.

HRC explored with Dr Tseng in other cooperative issues and signed agreements. Dr Tseng expressed his willingness to disseminate SHP technology and products developed by HRC in the U.S.A and South American countries. ■

The 1st CDM Capacity-Building Training Course for SHP Successfully Concluded

On 26 October 2007, the 1st CDM capacity-building training course for SHP (small hydropower) sponsored by Rural Hydropower & Electrification Development Bureau, Ministry of Water Resources, and organized by the National Research Institute for Rural Electrification (NRIRE), Ministry of Water Resources in Hangzhou was successfully concluded. During this training, great attention has been paid from Rural Hydropower & Electrification Development Bureau, with the leaders present on the training. Our institute, NRIRE, made every effort to prepare and compile the teaching materials on "CDM Project Development Document (PDD) for SHP". The training period was short, however, with pretty substantial and practical content the training course achieved the expectation.

The 4-day training suitcases 8 special subjects, such as concept of CDM, CDM project flow-chart & SHP market, SHP CDM methodology, international carbon market development analysis, opportunity & risk in the international cooperation for SHP CDM, etc., which combined case studies and exchanges to make participants understand the significance of CDM implementation in hydropower sector.

All the participants expressed their appreciations for everything organized during the training. On the evaluating questionnaires, participants fully affirmed the achievements of this training course and gave a score of 92.58 (the total is 100). Cherishing the profound friendship among staffs working in the hydropower industry, participants earnestly hoped that our institute could explore more chances for them to exchange the experience and promote the mutual progress. At the same time, these participants made valuable suggestions for our work, which no doubt would be helpful to us in future.■

HRC Participant Attended "Management of Hydropower Development 2007"

Spnsored by Swedish International Development Agency (SIDA), HRC participant, Mr.Pan Daqing attended the "Management of Hydropower Development 2007" —— an advanced international training programme held in Stockholm, Sweden from Sept. 2 to Sept. 28.

The course was one of the global training programmes on hydropower development under the sponsorship of SIDA, aiming at enhancing managerial and technical skills and covering subjects of strategic importance to sustainable economic and social development. Entrusted by Sida, Vattenfall, a leading European energy company, conducted the training programme, attended by 22 delegates from 11 countries, with 4 particpants from China.

A very useful lecture was the introduction to methodology, a logical framework approach (LFA) by Kari. The topic was important and interesting so that participants were extremely earnest to do the group work. The method is appropriate and applicable not only to projects of hydropower development, but also applicable virtually for all other fields.

The non-technical presentation on Hiv/Aids and infrastructure development by Lise Munck was impressive. Whether you are working in the hydropower sector or not, the topic was important to all. The significance the lecturer exposed that prevention plays a key role especially at the initial stage. If neglected, you will have to pay much higher price than expected and sometimes it could go far beyond control. The lecture started with a quiz, attracting much of the attention in a new way. The three countries Thailand, Egypt and South Africa taken as examples vividly illustrate how important it is to prevent something at the very initial stage.

The visit on the date of 17th Sept. to Stornorrfors Hydropower Station built at Ume River is beneficial. The station was firstly built in the 1950's with 3 units at that time. In 1985 one more unit was added, thus with the total installed capacity reaching 600 MW. Though the station was put up some 50 years ago, it is still operating in sound condition. The noise from the units is quite low. The operators for the whole station account for only 12 persons. At the central controlling room, 3 staffs are seen on duty at the day time. At night, no one is on duty there, but the operators work and control at home, as we were told. According to the introduction by Vattenfall engineers, the annual output amounts to as high as around 2500 GWh.■

Customers from Turkey Visited HRC

From October 16th to 19th, a 3-person group from RC Corporation in Turkey paid a visit to HRC, after our initial visit to them. In the meeting both sides interchanged opinions deeply on the key issues of equipment selection and technical proposal for two hydropower-projects about to cooperate. We also arranged the visits to the manufactories and the hydropower stations designed by HRC, which was satisfactory to the guests. They expressed in earnest that the equipment-supply scope could be confirmed and the agreement could be signed as soon as possible. ■

New Contracts Awarded for SHP Equipment Export

Hangzhou Yatai Hydro Equipment Completing Co., Ltd., a sub company of HRC, just won two orders for delivering SHP equipment (1×250kW and 2×4500kW) to two respective IPPs (independent power producer) in Turkey. ■

HRC's Training Workshop for Mongolia Taishir SHP Opened

On 10th of July, the Training Workshop on Operation & Maintenance for Mongolian Taishir Power Plant was opened and 12 operators from Mongolia attended the 4-week training at HRC.

The electro-mechanic equipment of the Plant has been designed by HRC's Design Institute and the controling equipment of the Plant will be supplied by HRC's R&D Center. The plant will be put into commissioning by the end of this year. ■

HRC's CDM Project Successfully Registered

The Diaoluohe SHP Station in Hainan province for which HRC has particpated in the application was successfully registered by the CDM Executive Council as another new CDM project on 22 June 2007. It has become the 90th CDM project in China and an annual reduction of 22,705 ton CO_2 is expected, thanks to the implementation of the projects. ■

Dray H'linh 2nd Cascade Hydropower Station Put into Commercial Operation

Dray H'linh 2nd Cascade Hydropower Station of Vietnam, designed by HRC'S Design Institute was formally put into commercial operation. The equipment of the Station was supplied by Dongfang Electric Corp in Sichuan province.

Dray H'linh 2nd Cascade Hydropower Station, located at the Srepok River in the central southern Vietnam, is of power station at dam-toe equipped with Kaplan turbine units. Its total installed capacity is 2×8000kW. Computer-based monitoring is adopted for the Station. All the electro-mechanical equipment is the proven product made in China. ■

2007 Training Workshop on Small Hydropower Successfully Concluded

On June 25, the 40-day 2007 Training Workshop on Small Hydropower was successfully concluded in HRC. In total, 31 officials and engineers from 18 countries all over the world attended the rewarding event with fruitful results.

At the closing ceremony, HRC leaders delivered warm speeches respectively, congratulated the participants on their good fulfillment of training plan and the achievement of remarkable progress. A piece of wisdom "Live and Learn" was presented for mutual encouragement. It was also highly appreciated that the participants were active and responsive in the class, and very cooperative during the training period. Finally, the leader addressed — "The door of HRC will open to you forever" —— fully expressed the sincerity and kindness of HRC to all the participants.

In succession, the participants also spoke one after another, with their heartfelt thankfulness respectively going to the Chinese government, the Ministry of Commerce (MOFCOM) and HRC, for the great aid, the organization of the program and the professional management on the training course. All the participants expressed truly that in future they would like to try their best to promote the substantial cooperation between China and their own countries, to strengthen the long-term friendship and together to make further contribution to the global SHP development.

Based on the hard-working and joint efforts over one month, and through the various lectures, on-site study and close technical exchange, each participant has scored a satisfactory result and obtained a certificate issued by the Chinese Ministry of Commerce.

The pen-drivers, copied with all the HRC's presentations, participants' country papers, photos of the whole training period as well as some pieces of Chinese traditional music, were distributed to all the participants, which aimed at enabling them to enjoy the wonderful experience and happy time forever …… ■

Vice President of TIS From Chile Visited HRC

Arranged by Science and Technology Department of Zhejiang Province, Mr. Victor, Senior Vice President of CHILE TIS Company, paid a visit to HRC, accompanied by the relevant staff of Shanghai Science & Technology Development and Exchange Center on May 14, 2007. A fruitful and in-depth talk was held between both parties on cooperating to develop small hydropower projects in Chile, Latin America and other related areas. In addition, Mr. Victor expressed appreciation for the technology, experience and achievements that HRC has made on SHP, and expressed that they would sign the cooperation framework agreement as soon as possible.

TIS, headquartered in the capital of Chile —- Santiago, is a trans-national private company dedicated to engineering and project management. Its business covers entire Latin America and has set to purchase small hydropower equipment in China. ■

HRC's Annual Report for 2007 & Working Plan for 2008

The year 2007 witnessed fruitful result in HRC's international cooperative projects. Entrusted by Chinese Ministry of Commerce, HRC conducted three TCDC training workshops on SHP with full success. Entrusted by Mongolian Ministry of Fuel & Energy, HRC implemented two training workshops on SHP technology with satisfactory result. Great efforts were taken to expand the international SHP market and hydropower equipment export volumn was increased by ten folds in 2007, as compared to 2006. International cooperation and information exchange were intensified and lots of international cooperative projects including those from Vietnam were contracted. Many overseas guests were hosted and a series of international missions conducted. The year 2007 was exciting.

I Implementation of international training workshops

1. TCDC SHP Training Workshop

Entrusted by Chinese Ministry of Commerce, 2006 TCDC SHP Training Workshop was conducted at Hangzhou by HRC from 19 Dec 2006 to 8 Feb 2007. It is the first time for HRC to conduct a training workshop with 42 participants from 30 countries,

which requires a higher level of organization, management and implementation. The training lasted a long period around two months and it is also the first time for participants from Uruguay, Georgia, Lesotho and East Timor to attend the training. With its constant efforts, HRC has overcome difficulty, and reached the ob-

jectives as expected. Through consolidating management and strengthening personnel, HRC organiser mobilized fully the initiatives among the participants themselves, i.e. realizing "self-autonomy". In addition, an international lecturer from Sweden was invited to give presentations for this

A list of international training workshops conducted in 2007

No.	Name of the training	Month	Participatory countries	No. of trainees	Sponsors
1	2006 TCDC SHP Training Workshop	Dec 2006 – Feb 2007	30	42	Chinese Ministry of Commerce
2	SHP Training for for Mongolian	4	1	13	Mongolian Ministry of Fuel and Energy
3	2007 TCDC SHP Training Workshop	5–6	18	31	Chinese Ministry of Commerce
4	Training on SHP Operation & Maintenance for Mongolian	7–8	1	13	Mongolian Ministry of Fuel and Energy
5	2007 TCDC SHP Training Workshop for African	8–9	11	36	Chinese Ministry of Commerce
Sum total				134	

SHP training workshop, broadening the horizon of the participants. Meanwhile, as designed by the international lecturer, the "Role Play" by the participants as SHP developer, poor villager, rich villager, politician, design engineer, consultant and journalist was so interesting and imaginative that HRC may adopt it for the upcoming SHP training workshops.

2. SHP Training Workshop for Mongolian

Cheerful boating on West Lake

The SHP Training Workshop for Mongolian was held with success from 10 to 24 of April by HRC. Attended altogether 13 participants from Taishir and Turgun SHP Stations of Mongolia, as entrusted by Energy Research and Development Center, Mongolian Ministry of Fuel and Energy.

The electric & mechanical design for Taishir Station was undertaken by HRC's Design Institute and the total isntalled capacity of the Station which was taken as the local pilot station accounted for 11 MW.

Apart from the appropriate SHP know-how transfer during the training, detailed and vivid presentations specially related to electric & mechanical design for Taishir SHP Station were given. Based on the main features of Taishir and Durgun SHP stations in Mongolia and in combination with the specific needs of the Mongolian participants, visits were arranged to some equipment manufacturers and SHP stations. Although the duration of the training workshop was only 15 days, all the "tailored" programs were carefully and tightly arranged. They were highly appreciated by the participants.

3. 2007 TCDC SHP Training Workshop

2007 Training Workshop on Small Hydropower was successfully conducted in HRC from 17 May to 25 June 2007, as entrusted by the Chinese Ministry of Commerce. In total, 31 officials and engineers from 18 countries all over the world attended this rewarding event with fruitful results achieved.

Sincere smiles from all

Friendship lasts forever

On-site study in SHP station

At the grand closing ceremony, some participants commented: "The Chinese people are so friendly, the development of the Chinese economy so fast and the Chinese public places so secure. How delighting to stay and have the training in China!" The participants all expressed sincerely that in future they would like to try their best to promote the substantial cooperation between China and their own countries, to apply what they have learnt in Hangzhou, China, to strengthen the long-term friendship and together to make further contribution to the global SHP development.

4. Training Workshop on Operation and Maintenance for Mongolian

Entrusted by the Energy Research and Development Center of the Ministry of Fuel and Energy, Mongolia, the Training Workshop on SHP Operation and Maintenance for Mongolian was conducted by HRC from July 10 to August 3, 2007 in Hangzhou, with 12 administrators and operators from Mongolian Taishir Power Plant attended, which scored full success. During the training, according to the characteristics of the participants, apart from the lectures on related technology and theory for power station, especially on the focus of key technology and operation specifications etc. which must be strictly mastered by the staff in daily management & operation work, a one-week on-site practice was also taken in the local hydropower station where the participants had achieved good results with full confidence to work in their new power station after returning home.

5. 2007 TCDC SHP Training Workshop for African


Congratulations on fruitful results

Sponsored by the Chinese Ministry of Commerce, 2007 SHP Training workshop for African Countries was held by HRC from August 16 to September 24, 2007 in Hangzhou. In total, 26 engineers and officials from 11 francophone African countries, i. e. Benin, Burundi, Cote d'Ivoire, Equatorial Guinea, Gabon, Guinea, Mali, Niger, Rwanda, Chad and Togo, attended this rewarding event with fruitful results achieved. Through 40-day study, the participants established deep friendship with HRC. In their mind, HRC was their mutual home in China, and the unforgettable experience here would benefit their future work.

The training workshop was rich in content, covering all fields of the small hydropower, from the comprehensive experience to specific technologies of SHP development in China, focused on the exploitation modes, hydro energy, hydrology, geology, site selection, civil works, electro-mechanical design and equipment, metal structure, automation and computer applications, economic evaluation, micro-hydropower and so on, as well as the special topics on SHP investment and financing, social-economic environment of SHP (by a lecture from France), SHP environmental protection, etc.. Chinese experience on SHP introduced was not only reliable, but also practical. With the moderate difficulty degree and pertinence, it could meet the requirements of SHP development in these African countries, creating favorable conditions for future technology exchange, economy and trade cooperation.

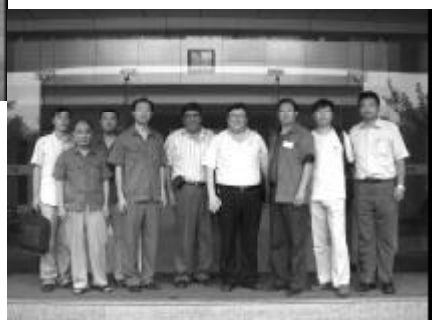

Group photo after a football match

Apart from the lectures in the classroom, site visits and study tours were arranged to Hangzhou Changhe Generating Equipment Co., Ltd. and Hangzhou Resource Power Equipment Co., Ltd. in Xiaoshan, Linhai Machinery Plant and Linhai Electric Machine Co., Ltd., CHINT Co., Ltd., Zhejiang Energy Group and Qinshan Nuclear Power Plant, so that the participants deepened their professional knowledge and extended the knowledge domain. Some of the participants had never been to the hydropower station before, so the visits were the real eye-openers to them.


Showing keen interest in the equipment manufacturer

II Hydropower Equipment Export

In 2007, making full use of the resources brought by international



training workshops for many years, HRC continued to expand the export trade business, and strengthened the contacts with Turkey, Peru, Philippines, Vietnam, Russia and other countries. The total value of export contracts amounted to 10.34 million US dollars.

1. A supply agreement has been signed with Peru on a set of Pelton unit with the installed capacity of 1200 kW. The shipment date will be at the end of April, 2008.


Signing contract to supply equipment to Turkey


Turkish Guests in HRC

2. A supply agreement was signed with Fiji on a 400-kW generator which has been delivered.

3. A supply agreement has been signed with Turkey on a set of Propeller unit (1 × 250kW). The shipment date will be in early January 2008, then the technical staffs of HRC will go to the site to guide the installation.

4. A supply agreement has been signed with Turkey on the hydropower equipments (2× 4500kW), planned to be delivered at the end of January, 2008.

5. A supply agreement has been signed with Turkey on the hydropower equipments (3 × 10000 kW) planned to be delivered at the end of December, 2008.

6. A supply agreement has been signed with Turkey on the hydropower equipments (3 × 5000 kW), and the shipment date is planned to be at the end of December, 2008.

7. A supply agreement has been signed with Turkey on the hydropower equipments (3 × 2700 kW) planned to be delivered at the end of October, 2008.

III International Cooperation and Information Exchange

HRC has spared no effort on SHP international cooperative projects, with the successful completion of Khe Dien Hydropower Project in Vietnam and the smooth implementation of Thai An Hydropower Project in Vietnam. A great number of international hydropower projects are still being explored and pursued, such as the design of Muong Hum hydropower station and some others in Vietnam, the reconstruction of the pump station in Uzbekistan, the technical rehabilitation of several hydropower stations in Central Asia, and the design of the hydropower stations in South America, etc.

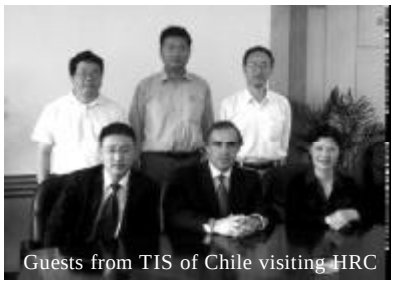
Improvements have been carried out to 2007 "SHP Newsletter" (in English), one of the publications of HRC, with several columns added, such as "HRC News", "Documents & Reports", "New Publications", etc. In 2007, over 500 papers were received for "SHP News" (in Chinese), the other publication of HRC, among which, 157 articles were selected and published.

The influence of HRC's homepage has been further increased, becoming an important window for publicizing and a platform for HRC staff to receive information more easily. In 2007, in total 83 pieces of information in Chinese and English were edited and issued, among which, 30 have been adopted in some other websites, such as the "Network of Science and Technology of Water Resource in China (www.chinawater.net.cn)", the "Information Network of Rural Hydropower and Electrification in China (www.shp.com.cn)" and the website of NHRI (www.nhri.cn), etc. In addition, 6 articles from HRC have been published in "China Water", introducing the modern new technology for rural hydropower and the information on check and acceptance of the research programs concerned.

Articles for "2007 Yearbook on Foreign Affairs of Zhejiang Province" which is one of the excellent publications in China, have been provided. HRC's annual summary on foreign affairs is also included in the yearbook.

IV Foreign guests hosted by HRC and HRC's Overseas Missions

1.Foreign guests hosted by


Guests from TIS of Chile visiting HRC

HRC

In 2007, 17 delegations, 163 guests in total, paid visits to HRC (shown in Annex I).

2.HRC's Overseas Missions

In 2007, HRC sent 9 missions, 13 engineers in total, to go abroad (shown in Annex II).

V R&D

In 2007, relying on technical renovation and with market-orientated system, HRC actively explored the domestic market. New phases were inaugurated for both scientific research and production. In total, 121 contracts on R & D projects have been signed. Six projects assigned from ministries have been completed, checked and accepted, including the "Research on Sustainable Development of SHP in China", one of the research projects on water resources planning and significant subjects of


Acceptance Meeting on Collection and Comparison of International Norms on SHP

the Ministry of Water Resources (MWR); the "Collection and Comparison of International Norms on SHP", one of the MWR special projects on standardization of water resources; the "Application and Demonstration of Automatic Control System in Rural Hydropower Station", one of MWR key projects on application of science and technology; the "New Auxiliary Equipment for Rural SHP Station", one of the MWR "948" projects; the "Unmanned Automatic Control System for Rural SHP Station", one of the agricultural transformation projects of the Ministry of Science and Technology (MST); and the "Key technology for Containerized SHP Station", one of the MWR "948" projects.

Another four projects assigned from ministries have also been


Acceptance Meeting on Research on Sustainable Development of SHP in China SHP

Completed, but waiting for the check and acceptance, i.e. the "Remote Automatic Meter-reading System for Rural SHP Station", one of the MST agricultural transformation projects; the "Simulation Research on Mutual Complementing System of Hydropower and Wind Energy", one of the Zhejiang Provincial projects on science, technology and planning; the "Research on Key Technology for Mutual Complementing and Energy Storage of Hydropower and Wind Energy", one of the Nanjing Hydraulic Research Institute (NHRI) fund projects; and the "Research on Key Technology for Mutual Complementing and Energy Storage of Hydropower and Wind Energy", one of the MST projects of public benefit.

The following four projects are being undertaken according to plan: the "Intelligent Control and Managerial Technology for Rural Hydropower Development", one of the MST projects on international scientific and technical cooperation; the "Equipment Function Development for Decentralized Hydropower-Wind


CDM Training by HRC

Energy Complementing Power Generation Tests in Rural Areas", one of the 2006 special projects on upgrading renovation of scientific instrument and equipment; the "Popularization and Application of Key Technology of Containerized SHP station", one of the 2006 agricultural transformation projects of MST, and the "Research on SHP Electricity Price and Power Grid", one of the NHRI fund projects.

Entrusted by the Bureau of Hydropower and Rural Electrification of MWR, HRC held a training course on CDM capacity building for SHP projects and other two on safety supervision of rural hydropower system. In total, 240 trainees from nearly 20 provinces and autonomous regions attended the training courses.

In 2007, 19 papers of HRC staff


CDM Training by HRC

were published in magazines (shown in Annex III).

The scientific research achievements greatly upgraded HRC's technical innovation capacity and the competitiveness in domestic and overseas markets, and nurtured a batch of professional scientific and research talents. The solid foundation has been established for HRC to strengthen international cooperation and exchange, and promote the export of Chinese SHP equipment.

VI Working Plan for 2008

1. We have applied for assignment of three international training courses on SHP from the Ministry of Commerce (MOFCOM). Guided by

the principle of "Considerate organizing, Standardized management, Cordial service, and Keeping close contact", which was put forward by the minister of MOFCOM, it is expected to further optimize the training staff, renovate the training mode, expand the training scope, enrich the training content, strengthen the training management and improve the training quality, so as to make more contribution to the foreign aid training programs sponsored by Chinese government.

2. To pursue the potential SHP cooperative project continuously, try to get on a new stage based on the contract volume of 2007.

3. To publish the book "Small Hydropower in Asia-Pacific Region —— Status quo and Problems" (English Version).

4. To promote the exchange and cooperation with USA and EU countries on SHP environmental protection, safety and guarantee, and rural power consumption management and system, etc.

5. Upon request, to organize outbound delegations for visiting and training related to water resources and hydropower.

6. To make continuous contribution to HRC's homepage by writing and translating papers and reports. ■

Annex I

Foreign Guests Hosted by HRC in 2007

No.	Time	Country/Organization/Number	Visiting Goal and Results
1	19/12/2006-8/2/2007	42 participants came from 30 countries	Attending 2006 TCDC small hydropower training workshop
2	10/4-24/4	13 staff in management and operation from Mongolian Taishir and Turgun hydropower stations.	Attending small hydropower technology training courses for Mongolia
3	14/5	Mr. Victor, vice president and other staff of TIS from Chile	A fruitful and in-depth talk was held between both parties on cooperating to develop small hydropower projects in Chile, Latin America and other related areas In addition, Mr. Victor expressed appreciation for the technology, experience and achievements HRC has made on SHP, and expressed that they would sign the cooperation framework agreement as soon as possible
4	17/5-25/6	31 participants from 18 countries	Attending 2007 TCDC small hydropower technology training workshop
5	17/6	2 staff of Tanzania Power Co.	They were both the former particpants of TCDC small hydropower international training workshops run by HRC. They revisited HRC, explored the cooperation and deepened friendship.
6	21/6	Dr. Zhao Chongwan and the other person from United Nations Asia-Pacific Centre for Agricultural Engineering and Machinery	Both parties briefed each other on their scope of business, technical characteristics and development goals, and exchanged views about future cooperation.
7	6/7	3 staff of Peru Engineering Co.	Signed sales contracts to supply impulse units

No.	Time	Country/Organization/Number	Visiting Goal and Results
8	11/7	MR Nicolas and other three staff of French Development Agency and ECDC Promotion Co.	Both parties briefed each other and explored cooperation opportunities. The guests believed that both parties could further cooperate on studying environmental impact, construction project evaluation, and technical training
9	10/7-3/8	12 staff in operation and management of Mongolian Taishir hydropower station	Attending Training on SHP Operation & Maintenance
10	16/8-24/9	26 participants came from 11 countries of Africa	Attending small hydropower technology training
11	3/9-9/9	3 customers of the Philippines	Discussion for cooperation on equipment supply
12	10/9	3 customers of Turkey	Discussion for cooperation on equipment supply, and visiting SHP stations
13	16/9-18/9	2 persons of French Development Agency	Presentations on SHP training courses and discussion of cooperation with HRC
14	16/10-19/10	3 staff of Turkey RC Co.	Both parties exchanged in-depth views on forthcoming cooperation of equipment selection and technology programs of the two hydropower projects.The customers visited the equipment factory recommended by HRC and SHP station designed by HRC
15	15/11-20/11	2 staff of U.S.A. ORENCO Co.	Further talk on cooperation of renovating West Lake station in Jin Hua and building small hydropower stations on Fox river in the U.S.A.
16	13/12	2 staff of Pakistan DI Co. and SITARA Energy Co.	Discussion conducted between two parties on cooperation and a planning diagram of hydropower development provided by Pakistani side.
17	26/12	The Chairman of Provincial Party Committee and other 11 persons of Hejiang province in Vietnam	Visiting and entrusting HRC with some small hydropower projects

AnnexII

HRC's Overseas Missions in 2007

No.	Time	Number	State Visited	Visiting Tasks and Results
1	28/1-12/2	1	India	Mr. Zhao Jianda attended the international training of "The Small Hydropower: Assessment and Development".
2	After 15/3	1	Thailand	Mr. Huang Jianping attended the fifth meeting of the Joint Steering Committee of Sino-Thai Water.
3	22/3-27/6	1	Cuba	Mr. Rao Dayi guided the installation of the mechanical and electrical equipment of Moiré hydropower station.
4	25/3-30/3	1	South Africa	Ms. Shen Xuequn attended the follow-up training activities of advanced hydropower management and development.
5	15/4-31/12	1	Mongolia	Mr. Cui Taizhen took on - site technical guidance of TASHIR Hydropower Station.
6	10/7-10/8 and 10/7-31/12	2	Mongolia	Mr. Wu Weiguo and Mr. Bao Yufei made on - site technical guidance for TASHIR Hydropower Station and relevant tasks.
7	30/7-20/8	2	Turkey	Mr. Lin Ning and Mr. Xu Wei went to Turkey for technical and commercial negotiations for building four hydroelectric projects and supplying Chinese hydropower equipment.
8	1/9-28/9	1	Sweden	Mr. Pan Daqing attended senior international training course for hydropower development, use and management.
9	6/12-22/12	3	Turkey	Mr. Xu Jincai, Mr. Lin Ning and Mr. Xu Wei went to Turkey to have technical and commercial negotiations for building two hydroelectric projects and supplying Chinese hydropower equipment

AnnexIII

A List of Papers/Publications of HRC in 2007

No.	Title of Academic Paper	Magazine Name/ Conference Name	Serial No	Academic Paper Category	Author
1	Analysis of Environment Impact in Rural Hydropower Engineering	"China International Power Generation Technology Conference", Shanghai, China, June 5-8, 2007. China Power Enterprise Association, State Grid Utility		International Academic Conference	Chen Xing

No.	Title of Academic Paper	Magazine Name/ Conference Name	Serial No	Academic Paper Category	Author
2	Factors Contributing to the Development of SHP in China	UK <Renewable Energy World> No.9-10, 2006 , PennWell	ISSN 1462-6381	Foreign Academic Journal	Pan Daqing
3	Environmental-Protection and Ecological Problems in SHP Development and Countermeasures	《 CHINA RURAL WATER AND HYDROPOWER 》 , No. 2, 2007 .	ISSN 1007-2284	Domestic Chinese Core Journal	Zhao Jianda Cheng Xialei Zhu Xiaozhang
4	The Recent Development of Environmental Integration of SHP in Europe	《 CHINA RURAL WATER AND HYDROPOWER 》 , No. 9, 2007	ISSN 1007-2284	Domestic Chinese Core Journal	Zhao Jianda
5	Analysis on Small Hydropower Investment and Financing in China	《 CHINA RURAL WATER AND HYDROPOWER 》 , No. 11, 2007	ISSN 1007-2284	Domestic Chinese Core Journal	Cao Lijun
6	Reflection on Developing "Green Hydropower Attestation" in Rural Hydropower Sector	《China Water Power & Electrification》, 2007.7.	ISSN 1673-2243	Domestic Chinese Ordinary Journal	Chen Xing
7	Analysis of sediment position in reservoir of Luozhahe cascade No.1 Hydropower Station	《 SMALL HYDRO POWER》, 2007.10.	ISSN 1007-7642	Domestic Chinese Ordinary Journals	Li Zhiwu Zheng Naibo
8	Research on Optimizing Development of Small-sized Cascade Station	《China Water Power & Electrification》, 2007.7.	ISSN 1673-2243	Domestic Chinese Ordinary Journal	Li Zhiwu
9	Research on Hydropower Exploitation Model of Downstream Reach of Luozhahe River	《 SMALL HYDRO POWER》, 2007.12.	ISSN 1007-7642	Domestic Chinese Ordinary Journal	Li Zhiwu
10	Inquiry of Strategic Guidelines for Development of Small Hydropower Technology in China	《 SMALL HYDRO POWER》, No. 1, 2007	ISSN 1007-7642	Domestic Chinese Ordinary Journal	Cheng Xialei Zhu Xiaozhang
11	Technical Level of Small Hydropower in China and Its Difference with International One	《 SMALL HYDRO POWER》, No. 2, 2007	ISSN 1007-7642	Domestic Chinese Ordinary Journal	Cheng Xialei Zhu Xiaozhang Lu Jianping

Report on the Training Workshop on SHP for Mongolia

The SHP Training Workshop for Mongolia was held from 10 to 24 of April by Hangzhou Regional Center for Small Hydro Power (HRC). Attended altogether 13 participants from Mongolia. This training workshop which is the 46th international SHP training workshop conducted by HRC has been entrusted by Energy Research and Development Center, Mongolian Ministry of Fuel and Energy.

In her speech at the closing ceremony, deputy Director of HRC, Ms. Cheng pointed out: "Through your 15 days study in HRC, you have learnt some essential technology and experience related to the development of SHP which is one of the most appropriate energy forms for the vast rural areas of the developing countries. It is expected that you will play a more active role in the exploitation of SHP resources in your own country and for the benefit of your people when you are back home".

Before conducting the training workshop, many rounds of discussions were held among HRC specialists so as to seek the optimized arrangement for the Mongolian participants. All the presentations and study tours were fit for the Mongolian actual SHP need. After the arrival of and with discussion with the Mongolian participants, further adjustments for the scheduling were made. The presentation introducing the technology and experience of SHP exploitation in China and the case studies related to the Taishir and Durgun SHP stations in Mongolia were appropriate and practical. Although the duration of the training workshop was only 15 days, all the "tailored" programs were carefully and tightly arranged. They were highly appreciated by the participants.

Most of the teachers were from HRC. The subjects included: small hydropower development in China, China in brief, low-cost and simplified civil structures, turbo-generator units and auxiliary equipment, electric equipment, case studies in technical refurbishment, electric design and computer application in SHP stations, operation and maintenance, etc. The concise and systematic courses enabled the participants to have a basic idea for every key chain in SHP operation and maintenance, laying a sound foundation for the operation and maintenance of SHP stations in Mongolia in the future.

Based on the main features of Taishir and Durgun SHP stations in Mongolia and in combination with the specific needs of the Mongolian participants, visits were arranged to Laoshikan and Xiaofeng SHP stations in Anji county and Changtan SHP in Huangyan county of Zhejiang province.

Laoshikan SHP station in Anji had a technical renovation implemented by HRC in 2004, with the present installed capacity of 3500 kW. Its safety, efficiency and ability to regulate peak and valley load were considerably increased. The adoption of micro computer supervision turned the original "operators" into "managers", reducing many of the staff. Thus, the operation cost was decreased. Detailed discussions were conducted during the visit with the station operators in terms of social, economic and environmental benefit by SHP. Very soon, the Mongolian participants will undertake the mission of managing and operating the SHP stations in Mongolia. So, they asked a lot of questions from the operators in Laoshikan and Xiaofeng SHP stations concerning the staff recruiting, training, regulations on work permit, on-duty, operation, taking leave, cleaning and etc.

The Changtan SHP Station that Mongolian participants visited was renovated by HRC. Its installed capacity is 11800 kW, which is much similar in terms of installed capacity, unit type and controlling equipment to Taishir SHP Station in Mongolia. Visits to such SHP stations surely benefited Mongolian participants.

Meanwhile, Mongolian participants had chance to visit Hangzhou Power Equipment Plant and Changhe Generating Equipment Co., Ltd so as understand the basic process of producing the turbo-generator units and auxiliary equipment.

Before ending the training workshop, discussion session was specially arranged by HRC for Mongolian participants and HRC's experts of various specialities were invited to the discussion. The atmosphere was more heated than expected. Many

questions regarding the SHP exploitation vs protection of ecological environment were put forward. HRC staff introduced the related situation in China and shared the experience with our Mongolian participants in this aspect, especially how to score a "Win-Win" target. The answers from the HRC staff were much appreciated by Mongolian participants.

Apart from classroom presentation, discussion and study tours, sightseeing programs were arranged. Though it is virtually not possible for participants to visit all the local scenic spots only at the weekends during this training workshop, the participants were able to enjoy the main natural beauty of some scenic sites in Hangzhou. In addition, shopping at various supermarket and local bizarre were also arranged. The trip to Shanghai was an unusual experience: a look at Oriental Pearl Tower---the top in Asia, walking at night around Nanjing Street—the busied street in Shanghai and visit to Yu Garden—Shanghai's ancient town. What an exciting experience it was! Participants admired and enjoyed the whole trip.

At the closing ceremony, HRC's leaders highly appreciated the diligence and industry shown by the Mongolian participants during the training period and congratulated on the fruitful result of the study. Meanwhile, the two directors of Taishir and Durgun SHP stations in Mongolia happily expressed their gratitude respectively to HRC for the efforts made to ensure the success of the workshop and cherish the friendly and cooperation relation with HRC, expecting more collaboration with HRC in the future. HRC presented a souvenir to every participant: a pen-driver of 1 GB which contains all the presentations by HRC's lectures and photos reflecting activities of this SHP training workshop.

At the farewell party, Mongolian participants sang many of the enchanting and melodious songs, expressing their enjoyment, happiness and friendship with HRC staff.

Finally, HRC would like to express its thanks to Mr P.Baatar who provided good interpretation for the whole training workshop.

According to the questionnaires collected, nearly all of the participants regarded that such SHP training workshop held by HRC were beneficial to them and all the subjects arranged by HRC were satisfactory. Based on earnest analysis and summary, HRC will continuously improve its quality of implementing such international training workshops and score better result in the future.

According to contract, HRC will hold another SHP training workshop for Mongolian operators at the end of June with duration of one month. Altogether 21 Mongolian participants will come to Hangzhou to attend it.

By now the SHP Training Workshop for Mongolia has ended and let it be the new start of more future SHP cooperation with Mongolia! ■

(HRC Secretariat)

Swedish SHP Owner Appeal to the European Court

An owner of a SHP plant in Sweden has, supported by SERO Hydropower, appealed to the European Court to change a decision from the highest level of the Swedish justice system. The background is that in Sweden older licenses to produce hydropower since 1994 can be changed if there is an environmental reason or a public reason that is stronger than the value of lost power production as a result of the decision. Normally this means that a producer is obliged to accept a

reserved flow corresponding to 5 percent of the gross income without compensation. The 5 percent income loss is normally translated to an annual loss of 5 percent of the energy production based on statistical figures.

However, in a recent case it was calculated from a theoretical value that took into account almost the whole flow volume of the year. Power plants of that kind have not yet been constructed and in this case there was an existing plant with more than 25 years of production statistics. A duration curve also showed the impossibility of the theoretical value.

As the various Swedish courts refused to take into account the obvious and basic facts in this case, the plant owner decided to bring it to the European Court by July 30, 2007.■

Source: ESHA

Small Hydropower Development in Nigeria

By

AJANI, Emmanuel A.

National Agency for Science & Engineering Infrastructure (NASENI)

1 Introduction

The United Nations in an attempt to stem the tide whereby most of the world's population live in abject poverty and a few swim in opulence declared the Millennium Development Goals (UN-MDGs). 189 nations pledged to achieve the following by 2015:

- Eradication of extreme poverty and hunger;
- Achievement of Universal Primary Education;
- Promotion of gender equality, women empowerment;
- Reduction of child mortality;
- Improvement of maternal health;
- Combat HIV/AIDS, malaria and other diseases;
- Ensure environmental suitability;
- Developing global partnership for development.

Lack of electricity or constant supply of electricity has been found to be a major cause of lack of development and limited wealth generation abilities of many communities. Where electric power supply is available and constant, the growth of cottage and small scale industries have resulted in improved life styles and economies of such communities. In Nigeria, many communities are still not connected to the National Grid. Even in the regions connected to the grid, there is a deficiency in power supply. By 2006, generation capacity was 3800MW, while the average national electric power demand stood at 9,800 MW. About half of the Nigerian population are still without electricity. In order to achieve the Millennium Development Goals (MDGs), bringing improved energy services to these communities becomes a priority.

The thrust of policy makers in Nigeria and the world over is to promote a healthy energy-mix. Various renewable energy sources like solar photovoltaic, wind energy, hydropower e.t.c. are being promoted. Small Hydro Power (SHP) plants are easier to install and manage (as against large Hydro Power installations) and may not require very high investments in transmission lines especially when used in the isolated mode, since the end-users are relatively close to the source of generation of the electricity.

The objectives of this report are to:

1) Explore the developing of Electric Power Generation in Nigeria

2) Review the status and future plans for the development of Small Hydropower in Nigeria

3) Discuss the development strategy for Small Hydropower in Nigeria

2 Electric Power Generation in Nigeria

2.1 History of Electric Power Generation in Nigeria

In 1866 two small generating sets were installed to serve the Colony of Lagos. The Electricity Corporation of Nigeria (ECN) was established in 1951 to run the power supply systems in the country. The Niger Dam Authority (NDA) was established in 1962 in order to generate hydroelectric power at Kainji, on the River Niger. NDA and ECN were merged in 1972 to form the National Electric Power Authority (NEPA). NEPA then, was fully in charge generation, transmission and distribution of electricity throughout Nigeria. During these periods many power stations were built. Starting with the 30MW thermal plant at Oji in 1956 to the first hydropower station at Kainji in 1968 with an installed capacity of 320MW to the 500MW natural gas-fired thermal plant in Delta state in 1990, Nigeria had a total installed capacity of 5981.6 MW.

In March 2005, the Electric Power Sector Reform Act was passed which gave rise to the establishment of Power Holding Company of Nigeria (PHCN) to replace NEPA. The Nigeria Electricity Regulatory Commission (NERC) was also established in the same year to serve as an independent regulatory agency.

By December 2005, only 9 power stations with a combined installed capacity of 4681MW were functioning, made up of 7 PHCN stations and 2 other stations operated by independent power producers.

2.2 Current Power Demand and Generation in Nigeria

By 2006, electricity generation capacity was 3,800 MW while the average national electric power demand stood at 9,800 MW.

The reform in the power sector has opened up the sector and this has encouraged the participation of the private sector in the generation and distribution of power. The independent power producers are now building power stations; some have been commissioned while the others are in various stages of completion. The government however did not leave everything in the hands of the private investors as it has embarked on building more power stations which on completion will boost the power available for distribution. The Federal Government of Nigeria is currently spending a total sum of US$ 3 billion to meet a 10,000MW target by the end of 2007. A total of 12 new power stations are being built by the government. They include new thermal power stations at: Geregu, Kogi State (414 MW), Papalanto, Ogun State (335MW), Omotosho, Ondo State (335MW), and Alaoji (310MW) in South Western Nigeria, Ikot Abasi in Akwa Ibom State (two stations: 188MW + 300MW), Sapele in Delta State (451MW), Omoku in Rivers State (230MW), Egbema in Imo State (338MW), Ihuabor (451MW), Calabar in Cross River State (561MW) and Gberian/Ubie (225MW).

In addition, in July 2006 the government agreed to start work on the Mambilla hydropower project, which is expected to generate 2600MW, and will be financed with loans from China, the Islamic Bank, and funding from the Federal Government of Nigeria.

2.3 New Policy on Power Generation

In order to remove the constraints of the power sector and achieve sustainable and affordable electric power supply for Nigeria, comprehensive reforms of the power sector have been articulated. The goals and objectives of the reform, stated in the National Electric Power Policy (NEPP) are to:

1.Improve the efficiency and affordability of power supply.

2.Encourage private sector participation and competition.

3.Attract private investment.

4.Establish an independent regulatory agency to ensure level playing feild for all stakeholders.

5.Provide a conducive environment for long term development of the sector.

The fundamental objective of the reform is to "ensure that Nigeria has an electricity supply industry that can meet the needs of its citizens in the 21st century". Other objectives are to "modernize and expand electricity coverage" and "to support national economic and social development".

The NEPP forms the basis of the provisions of the Electric Power Sector Reform Act (EPSR) which was enacted in March 2005. The Act provides for:

1.The unbundling of the defunct NEPA and the establishment of successor companies (Part I).

2.The development of a competitive electricity market (Part II).

3.The establishment, functions and powers of the regulatory commission (Parts III – VII).

4.The establishment of Consumer Assistance Fund to subsidize under-privileged electricity consumers (Part VIII).

5.The establishment of Rural Electrification Agency and Fund to increase rural access to electricity (Part IX).

3 Small Hydropower in Nigeria

In Nigeria, 30MW has been adopted as the maximum rating for small hydropower. Mini hydros are those with installed capacity of less than 1MW and micro hydro for those with capacities less than 100KW.

3.1 Small Hydropower Potentials in Nigeria

From a 1980 survey of 12 of the old States of the Federation, as shown in Table 1, it was established that about 964MW of Small Hydropower (SHP) can be harnessed from 277 sites. The potential would of course

Table 1 Small Hydro Potential in Surveyed States of Nigeria

S/No	State (pre-1980)	River Basin	Total No. of Sites	Total Capacity (MW)
1	Sokoto	Sokoto-Rima	22	30.6
2	Katsina	Sokoto-Rima	11	8.0
3	Niger	Niger	30	117.6
4	Kaduna	Niger	19	59.2
5	Kwara	Niger	12	38.8
6	Kano	Hadeija-Jamaare	28	46.2
7	Borno	Chad	28	20.8
8	Bauchi	Upper Benue	20	42.6
9	Gongola	Upper Benue	38	162.7
10	Plateau	Lower Benue	32	110.4
11	Benue	Lower Benue	19	69.2
12	Rivers	Cross River	18	258.1
Total			**277**	**964.2**

increase when the rest of the country is surveyed. It is presently estimated that the total SHP potential could reach 3,500 MW, representing 23% of the country's total hydropower potential.

3.2 Status of Small Hydropower in Nigeria

The total installed capacity of existing small hydropower schemes in Nigeria stands at 30MW as listed in Table 2. Seventy percent (70%) of this total (or 21 MW) is generated from 6 sites in Plateau State by the Nigerian Electricity Supply Corporation Ltd. (NESCO) an existing Independent Power producer (IPP).

3.3 On-Going Small Hydropower Projects

Currently, the Federal Government of Nigeria is working on the following small hydro projects:

1) Generation of 30MW from Dadin-Kowa. The civil work is already completed and some of the electromechanical equipments also installed.

2) Generation of 1MW from the Obudu cattle Ranch. The feasibility study will be completed by May 2007.

3) A micro pilot project to generate 40KW at Ehvboro in Edo State

3.4 Future Plan for Small Hydro

It is presently estimated that the total SHP potential could reach 3,500 MW, representing 23% of the country's total hydropower potential. The projection is that by 2015 at a generation capacity of 15,000MW, 5% of this capacity will come from renewable energy and 70% of that 5% from small hydro.

4 Development Strategy

In order to make small hydropower (SHP) viable in Nigeria, there is a need to minimize optimally, the investment cost through the:

1) Integration of SHP projects with other water resources projects

2) Development of local capacity in construction techniques and equipment fabrication.

The Federal Government through the Renewable Electricity Action Programme is giving priority to projects with "low-hanging fruits" that is, projects that will provide quick gains in achieving the targets of the programme. Priority will be given to mature technologies, cost effectiveness of projects and possibilities of building partnerships with other sectors in delivering sustainable development.

Over 30 multipurpose dams built by the Federal Ministry of Water Resources have small hydro power component designs. None of these dams are currently producing electricity. Some of the dams require minimal or no civil works and the installation of electromechanical equipment. Over the next 10 years, the Federal Ministry of Power and Steel will partner with the Federal Ministry of Water Resources in delivering power from these dams through public-private partnership that will concession these dams through competitive tenders.

Also, there are about 130 other dams which have no small hydropower component but with proper survey, some civil works and installation of electromechanical equipment, could be used to produce electricity.

The Federal Government of Nigeria is also prioritizing the domestic production of equipment for renewable energy technologies, small hydropower inclusive, as a means of achieving a sustainable development in this sector.

4.1 NASENI Project on Small Hydropower

The National Agency for Science and Engineering Infrastructure (NASENI) was established in 1992 as a parastatal under the Federal Ministry of Science and Technology (FMST). It was set up to execute all aspects of the Science and Engineering Infrastructure Policy of the Federal Government of Nigeria. NASENI's mission is to establish and nurture an appropriate and dynamic Science and Engineering Infrastructure base for achieving home-initiated and home-sustained industrialization process through the development of relevant processes, appropriate local machine design and machine building capabilities for capital goods and equipment manufacture for job creation, national economic well being and progress.

The National Agency for Science and Engineering Infrastructure (NASENI) has initiated a Small Hydropower project with the following

Table 2 Existing Small Hydro Schemes in Nigeria

S/No	River	State	Installed Capacity (MW)
1	Bagel I	Plateau	1.0
	Bagel II	Plateau	2.0
2	Ouree	Plateau	2.0
3	Kurra	Plateau	8.0
4	Lere I	Plateau	4.0
	Lere II	Plateau	4.0
5	Bakalori	Sokoto	3.0
6	Tiga	Kano	6.0
Total			**30.0**

objectives:

- To promote the use of small hydropower as a renewable energy option for Nigeria
- To survey the feasibility of integrating small hydropower plants in the large number of dams currently used for water supply and irrigation only
- To develop local manufacturing capabilities on Small Hydropower equipment in order to achieve the Local Content Policy targets of the Nigerian Government
- To midwife the establishment of local manufacturing companies for electromechanical equipment of small hydropower plants.

4.2 Methodology

The National Agency for Science and Engineering Infrastructure (NASENI) is adopting the following programmes in order to achieve these set goals:

1) Continuous and strategic training of professionals in small hydropower technology, in order to build a critical mass of skilled professionals

2) Collaborative survey of the 160 dams currently unutilized for power generation, in order to quickly reap "low-hanging fruits"

3) Joint Venture partnering with relevant ministries, agencies, organizations, local and foreign investors towards the establishment of small hydropower plants at these sites

4) Joint Venture partnering with local and foreign investors towards the establishment of manufacturing companies for turbines and generators.

4.3 Incentives for Investment

As part of the efforts to provide an enabling environment that is conducive to the growth and development of industries, inflow of Foreign Direct Investment (FDI), shield existing investments from unfair competition, and stimulate the expansion of domestic production capacity; the Federal Government of Nigeria has developed a package of incentives for various sectors of the economy. These incentives, it is hoped, will help revive the economy, accelerate growth and development and reduce poverty.

Within the past few years following the end of military dictatorship in Nigeria, government has progressively introduced a number of incentives designed to promote investments. Some of these are grouped as follows:

4.3.1 Industrial Sector

4.3.1.1 Taxation

Fiscal measures have been drawn to provide for deductions and allowances in the determination of taxable income of manufacturing enterprises, including:

- Pioneer status, which is a concession to pioneer companies located in economically disadvantaged areas, providing a tax holiday period of five to seven years. These industries must be considered by the government, to be beneficial to the country's economy and in the interest of the public.
- Companies that are involved in local raw material development;
- Local value addition;
- Labour intensive processing;
- Export oriented activities;
- In-plant training; are also qualified for additional concessions.

Local Raw Materials Utilization

30% tax concession for five years to industries that attain minimum local raw materials utilization as follows:

- Agro - 80%
- Agro allied - 70%
- Engineering - 65%
- Chemical - 60%
- Petro-chemical- 70%

Local Value Addition

10% tax concession for five years. This applies essentially to engineering industries, while some finished imported products serve as inputs. This is aimed at encouraging local fabrication rather than the mere assembly of completely knocked down parts.

In-Plant Training

2% tax concession for five years, of the cost of the facilities for training.

Export Oriented Industries

10% tax concession for five years. This concession will apply to industries that export not less than 6% of their products.

Infrastructure

20% of the cost of providing basic infrastructures such as roads, water, electricity, where they do not exist, is tax deductible once and for all.

Investment in Economically Disadvantaged Areas

100% tax holiday for seven years and additional 5% depreciation over and above the initial capital depreciation.

Abolition of Excise Duty

All excise duties were abolished with effect from the 1st of January, 1999.

Import Duty Rebate

A 25% import duty rebate was introduced in 1995 to ameliorate the adverse effect of inflation and to ensure increase in capacity utilization in the manufacturing sector. Investors are however, advised to ascertain the current operative figures at

the time of making an investment, because these concessions have undergone some amendments in the past few years.

Re-Investment Allowance

This incentive is given to manufacturing companies that incur capital expenditure for purposes of approved expansion of production capacity; modernization of production facilities; diversification into related products. It is aimed at encouraging reinvestment of profits.

Investment Tax Allowance

Under this scheme, a company would enjoy generous tax allowance in respect of qualifying capital expenditure incurred within five years from the date of the approval of the project. Dividend from companies in manufacturing sector with turnover of less than N100 million is tax-free for the first five years of their operation.

4.3.1.2 Investment Guarantees/Effective Protection

Transferability of Funds

Section 24 of the Nigerian Investment Promotion Council (NIPC) decree provides that a foreign investor in an enterprise shall be guaranteed unconditional transferability of funds through an authorized dealer in freely convertible currency of:

- Dividends or profit (net of taxes) attributable to the investment;
- Payments in respect of loan servicing where a foreign loan has been obtained;
- Remittance of proceeds (net of all taxes) and other obligations in the event of a sale or liquidation of the enterprise or
- Any interest attributable to the investment.

Guarantee against Expropriation

By the provision of section 25 of the same NIPC decree, no enterprise shall be nationalized or expropriated by any government of the federation, unless the acquisition is in the national interest or for public purpose; and no person who owns either wholly or in part, the capital of any enterprise shall be compelled by law to surrender his interest in the capital to any other person. These can only be done under a law that makes provision for:

- Payments of fair and adequate compensation; and
- Right of access to the courts for the determination of the investor's interest or right and the amount of compensation to which he is entitled.

In addition to all these safeguards, the Nigerian government is prepared to enter into Investment Protection Agreement with foreign enterprises wishing to invest in Nigeria.

4.3.1.3 Access to Land

Any company incorporated in Nigeria is allowed to have access to land rights for the purpose of its activity in any state in the country. It is, however, a requirement that industrial companies comply with regulations on use of land for industrial purposes and with environmental regulations. Land lease is usually for a term of 99 years unless the company stipulates a shorter duration.

4.3.2 Energy Sector

All areas of investment in this sector are considered to be pioneer product or industry. As a result, there is a tax holiday of 5 to 7 years for investments in the sector.

There has been a deregulation of this sector resulting in the emergence of Independent Power Producers (IPP).

5 Conclusion

Electric power generation and supply is still deficient in Nigeria. The Power sector is currently undergoing well articulated reforms to achieve sustainable and affordable electric power supply. Small hydro is going to play an important role in this new development having being identified as a suitable source of renewable energy. Even though the Federal Government is building more power stations, the sector has been liberalized and new Independent Power Producers (IPPs) have been licensed. There is a big and growing market for Small Hydro products. More private investments, local and foreign, are still required. Several investment incentives have been put in place, up to 7 years tax holidays for foreign investors.

For a sustainable development of small hydro in Nigeria, the development of local manufacturing capabilities of SHP equipment and local capacities in construction techniques need to be further developed.

The National Agency for Science and Engineering Infrastructure (NASENI) and other relevant agencies, ministries and organizations are working towards creating the much needed enabling environment to achieve a sustainable development of Small Hydropower in Nigeria. However, more joint partnering (Joint Venture projects) local and foreign, are still required.■

About the Author: *AJANI, Emmanuel is a Mechanical Engineer working with the National Agency for Science and Engineering Infrastructure (NASENI), an agency under the Federal Ministry of Science and Technology of Nigeria.*

E-mail:ajaniae@yahoo.com, ajani.emmanuel@naseni.org

Case Study on the Construction of Double-curvature Concrete Arch Dam

By

Li Zhiwu

Hangzhou Regional (Asia & Pacific) Center for Small Hydro Power

Abstract: *the double-curvature concrete arch dam is commonly used for medium & small-sized hydropower projects. Through analyzing the construction technology, approach, technics and quality control etc. for the double-curvature concrete arch dam of Furong reservoir, this article illustrates characteristics and experience, such as saving the cost and facilitating the construction process & management of dam-base treatment, plane & vertical transport of concrete, shuttering, pouring and temperature control etc. for the construction of a concrete arch dam, which can be taken as reference for similar projects.*

Keyword: double-curvature arch dam; concrete; construction technology; case study

The dam of Furong reservoir is located in Changshan County, Zhejiang Province, which is one of the key projects in Zhejiang. It controls a catchment of 126km^2, with a total reservoir capacity up to 95.8 million m^3. The dam adopts a parabola double-curvature arch type of concrete C15W6F50, and the maximum height is 66m. 3 sluice orifices are made on the dam-crest surface, with each of 6m in the net width, and arc steel gates are applied there.

I General Layout of Construction

1. Wind-supply system

There are 2 wind-supply plants, one is at about 120m downstream of the dam in which one 10m^3 air-compressor is used to supply wind for the excavation of right bank and riverbed, and the other is located at about 80m downstream of the left abutment inside which another 10m^3 air-compressor is erected as to provide wind for the excavation of left bank and temporary works. For the sake of small partial excavation in early stage and drilling for consolidation grouting, there are also equipped two sets of 3m^3 electrically mobile air-compressors.

2. Water-supply system

Water supply adopts one 100D16 grade-8 centrifugal pump with a high lift head, thereby supplying water to ponds through a pipe of 4 inches in its diameter. Water ponds are placed at inner side of the road crossing the dam, about 100m upstream of the dam, and there are 4 cylindric steel water ponds with each capacity of 27m^3. The cooling water for dam is directly from the water pipe of 4 inches in a diameter near the pumping house.

3. Power-supply system

Two substations are erected, one is placed at the upstream of dam on which one 400kVA transformer is installed to provide electric power to the dam site, and the other is located at the quarry where one 80kVA transformer adopted to supply electric power for aggregate production and living purpose.

4. Aggregate producing system

The concrete aggregate adopts natural sand and rock, and the sand & rock producing system is situated about 1.5km upstream of the dam, including a screening device. The maximum daily production of the system amounts to about 600m^3, which can meet the requirement of max. concrete pouring per month, i.e. 11000m^3. In order to balance the production of the sand & rock materials and the concrete, a storage of about 3000m^3 for finished materials shall be placed near the quarry. Furthermore, to coordinate the production of the aggregate and the quarry material, and also mitigate the impact of flood on the aggregate generation, another storage of 30000m^3 for the quarry materials shall be located upstream of the processing workshop.

The sand & rock producing system is composed of a 1m^3 backacter, a ZL50 loader, a mesh screen, a SZ1300 × 6300 shaking

screen, 3 sets of 4-6 inch submersible pumps, 4 sets of 5t dump trucks and 2 sets of 13.5t dump trucks.

5. The concrete mixing system

The concrete mixing system is situated on a slope within a 100m-range of the upstream left bank, including material storing & batching part, feeding part and mixing part. The material storing & batching system is located in 60-100m upstream of the dam, with a gallery bunker applied at the bank slope. Based on the actual topographic and geologic conditions, the bunker is shaped in a 40m×15m rectangle, and its stacking height is 12m and the finished material of 1800m^3 can be stored. The feeding elevation of bucker is 280m, and the discharging elevation is 265m. According to the concrete grading requirement, the bucker is divided into 5 compartments, among which the concrete (3m–thick for the lower part) and the brick wall (upper part) are applied for separation. Each compartment is equipped with 2 blanking holes, and each kind of graded aggregate enters the weigh bucket through the blanking hole, and after weighing, it is discharged on a belt conveyer with a width of 800mm, and finally sent into the feed hopper of mixing plant.

Cement shall be manually unpacked inside the cement storehouse, and hereafter conveyed to the feed hopper through a Φ 450mm hard PVC pipeline.

The mixing plant is made of steel structure, with a height up to 11m. There are 3 layers, top floor is for feeding with a height of 3m, on middle floor is installed a control board and the mixing machines (3.1m high), and bottom floor is for concrete discharging with a height of 5m. The material-feeding elevation of mixing plant is 265m, and the discharging elevation is 255m. 2 sets of 1m^3 mixing machines are symmetrically arranged inside the mixing plant, and the producing capability is 240m^3 concrete/machine/shift, and the maximum monthly generating capacity is 12000m^3.

6. The concrete conveying system

The horizontal transport of concrete from the mixing plant to the lifting point of a telfer is carried out by 2 flatcars along with 4m^3 buckets, on 762-type light rails driven by a 3t windlass. In order to improve the efficiency and speed up the concrete pouring, 2 buckets shall be adopted alternatively.

The vertical and horizontal transport of concrete from the lifting point to the concrete pouring surface of the dam shall be undertaken by the fixed cable crane.

The lifting capacity of cable crane is rated at 15t, with a span of 280m, the maximum lifting height up to 107m and the deflection 15m. The ends of cable crane are fixed on slopes of both banks by means of ground anchoring piles, and the anchor is 331m in elevation, and the height difference between the anchor and the dam crest is 52m. The bucket is horizontally dragged by a 5t-windlass on an auxiliary cable between upstream and downstream, and the maximum horizontal dragging distance can extend about 20m. Except dam section 1, 2 and 11 where concrete cannot be directly supplied above an elevation of 260m, others can be poured with concrete directly by cable crane. In case concrete cannot directly reach the pouring spot, an access needs to be put up, so cable crane shall lift concrete to an adjacent dam section, then a double-rubber-tyre cart is used to convey the concrete to the spot for pouring.

7. The storehouse for cement and flyash

The cement warehouse is placed at the external side of road crossing the dam, above the mixing plant, with an elevation of 280m, and its storage totals about 450t that can meet the peak demand for 7 days.

The flyash storehouse is placed at the external side of road crossing the dam, downstream of the left bank, with a capacity of about 280t.

II Excavation of Dam Foundation

1. Excavation of soil, sand and gravel

Vegetation and superficial soil shall be cleaned up manually, and sand, gravel and road spoil be excavated mechanically. A hoe shovel of 1m^3 and a self-loading truck of 5t capacity are applied for excavation and transportation.

2. Rock excavation

(1) Excavation procedure

Rock excavation at both banks shall be carried out simultaneously from upwards to downwards. Spoil at left abutment shall be excavated by mechanical means. At the right abutment, manual excavation is applied for the place above 250m in elevation, and below that, mechanical means shall be used, with a hoe shovel of 1m^3 capacity. The excavation of both banks shall be followed with rock excavation for the foundation pit. All the rock excavation shall be based on the process of firstly excavating the common rock, and then the protective layer.

(2) Excavating method

The excavation of common rock shall adopt a method combining the use of down-the-hole drill and pneumatic drill. For the common rock excavation of over 6m deep, the down-the-hole drill shall be applied for making pores, and then electric detonator and blasting fuse be used for lad-

der-shaped extrusion blasting if possible. If the down-the-hole drill is not suitable to make pores for common rock excavation, the pneumatic drill can be applied to make pores for blasting the common rock. Rock excavation on the protective layer of dam foundation shall apply the smooth blasting technology, with blasting layer thickness of 80-100cm and pore distance of 60-80cm. The explosive is interruptedly filled inside the pores, and the pores are linked with blasting fuses.

III Treatment of Foundation

The foundation treatment is mainly composed of consolidation grouting, curtain grouting, drain hole and contact grouting.

1. Consolidation grouting

Since reinforced meshwork is laid and the process needs to be accelerated, a pipe-pulling method is thus adopted at the riverbed section, that is, holes are made before concrete pouring and then the 2-inch steel pipe is pre-embedded. The outside of steel pipe shall be painted with mould oil, and it is rotated as concrete pouring, and the pre-embedded pipe shall be pulled out after concrete consolidating finally. When the intensity of covered concrete reaches 50%, the depth of hole shall be rechecked, and in case of any blocking inside, pneumatic drill shall be used to make it through. After the depth meets design requirement, grouting shall be made. The 01-30 type of pneumatic drill is applied for making pores with a depth of 6m into the base rock, and the diameter of 38mm. The consolidation holes shall be arranged as cinquefoil shape, and hole-distance and row-distance are both 3m, and this construction consists of 2 procedures. At the faultage and cranny places, reinforcing holes shall be accordingly increased, and drilled holes shall be washed by means of wind and water until the water returning back becomes clear. The grouting shall be undertaken by purely pressing in one time for the whole hole, with the grouting pressure of 0.5MPa, and the water-cement ratio is 3:1. The slurry change and the finishing standard etc. shall all be based on the specifications.

2. Curtain grouting

On the dam foundation, a row of waterproof curtain holes shall be arranged, and both dam ends shall be respectively extended for 15m and 18m long by means of grouting adits. The grouting-hole distance is 2.5m, and grouting shall be undertaken through separate process. The construction inside gallery is divided into three processes, and two construction processes be applied for other places. The curtain grouting needs to be started after consolidation grouting and contact grouting at the related dam sections, with a 150-hydraulic type of geological borer applied for making holes of 56mm in the diameter, and the hole depth shall be 8-10m under the relative aquiclude ($q \leq 1Lu$) beside no less than the design depth.

Before grouting, pressurized water shall be used for a wash, and the washing pressure is 0.8 times of the grouting pressure and it shall be no more than 1MPa, and washing ends after the returned water is clean. At first, the guide hole shall be tested with pressurized water section by section from upwards to downwards, called a single-point method, and a simple water-pressing test shall be applied for each grouting section of every sequential grouting hole. The grouting is undertaken by section from upwards to downwards, and the sectioned length is generally 1.5m for the contact part, and 5m for each part below. The circulating grouting method shall be used for the inside hole, with grouting pressure of 1.0-2.0Mpa. Hole enclosing shall adopt a sealing method of section pressure grouting. The slurry change and the finishing standard etc. shall meet the specifications.

3. Drain hole

A group of drain holes shall be arranged downstream of the curtain grouting on the dam foundation, with hole distance of 3m and diameter of 110mm. The depth of drain hole into the base rock is 0.6 times of the curtain depth there and it shall be no less than 10m, and the drain holes inside the gallery incline towards the downstream by an angle of 3^{o}, and those on the bank slope lean to the upstream with an angle of 3^{o}.

Drain holes of bank slope shall be drilled on the concrete sidesteps after the dam, and the construction of drain holes shall be commenced after the related curtain grouting is completed and accepted by testing, and holes shall be made by a 150-hydraulic type of geological borer equipped with a bort bit.

4. Contact grouting

The contact grouting covers the whole dam foundation of right bank, and the holes for consolidation grouting can be still adopted, that is to use the pneumatic drill to clean the holes from their openings until 1m beneath the base-rock surface. Before pouring the concrete, a galvanized iron pipe of 1 inch shall be embedded to extend toward the downstream dam surface. The grouting pressure is 0.5Mpa, and the grouting construction shall be undertaken according to two processes.

IV Concrete Pouring for Dam

The concrete pouring for dam body shall apply a successively &

meanly ascending mode by thin layers.

1. Measuring and lofting

Before starting concrete works for the dam, the measurement team has already intensified the control network of dam area, and construction lofting for the dam shall adopt the intensified Grade-4 control network, and a ND3000S infrared range finder used to determine gage-station sites on dam. Then a wildT_2 electronic theodolite shall be applied to loft the shuttering points through the polar-coordinate method, and the lofting intensity is one point for each 1.5m. After lofting, the measurer will check the size with a steel rule, and in case of any questionable part, recheck shall be carried out as to confirm there is no error before shuttering made by woodworkers.

2. Treatment for foundation surface or concrete construction joint

The loose rock on base-rock surface shall be cleaned up by manpower.

The plane construction-joint shall be washed by highly pressurized water, as to get rid of concrete burrs. After consolidation, the superficial concrete skin shall be eradicated by highly pressurized water until fresh dinas exposes. Before concrete pouring, dirt and water on base rock or concrete shall be removed, and the surface be made wet with water, then a 2-3cm-thick mortar with the same grade shall be placed at the mean time.

3. Scaffold

The scaffold for upstream & downstream sides of dam body adopts the tripod which is made of ¡Ï65¡Á65 angle iron for construction, and on the scaffold are erected plates, and the safety net shall be put up for the suspending part. The scaffold is only used for the shuttering purpose.

4. Erection of water & grout stops

The water and grout stops shall be oxygen welded at both sides, and after finalized in the machining shop, it shall be welded and erected on site.

5. Shuttering

Formwork is mainly made of steel, and side angles with abnormal shape shall be amended by a wooden formwork. The formwork shall be fixed by a ϕ10mm lacing wire, supported with prefabricated concrete column. Before concrete pouring, check shall be made, and during the pouring, a woodworker shall watch on, as to make adjustment timely in case of any loose. Besides the technics commonly applied, shuttering shall adopt a kind of construction measures with sleeve screws fixed to the lacing wire, so as to improve its profile quality, that is, the machined sleeve screw is rotated on the lacing wire for fixing the formwork, and the head of sleeve screw shall be placed inside the dam body by 2-3cm. After removing the formwork, a spanner is used to move the sleeve screw away, and the same mortar shall be adopted to envelop the screw hole left. So from the outside, the actual effect is very good, and it seems that there is no construction impact of the lacing wire on the dam body, and its surface is smooth and even.

6. Making & erection of reinforced steel

The reinforced steel shall be mainly made by manpower inside workshop, and poured and erected at the site. Steel number, specification, size and amount etc. of the reinforced steel shall be strictly based on design drawings, and it shall be erected according to the related standard.

7. Concrete pouring

The limited foundation area for concrete-pouring layer is controlled as 1.5m, and the non-limited area shall be controlled within 2-3m, on the basis of the dam structure and the temperature-controlling requirements. The concrete trimming shall be undertaken by means of an oscillator and a manually-pulled shovel, and during the trimming, the aggregate needs to be meanly placed, and ascends layer by layer. The thickness of each layer shall be within 50cm. The high-frequency inserting oscillator is applied, and at corners and small-sectional structures, an electric oscillator with flexible shaft is used, and during oscillation, attention shall be attached to strictly control the oscillating time and space for concrete, and its shaft shall be inserted into the lower concrete layer by 5cm, until concrete does not sink any more, there is no bubble, and bleeding begins.

8. Concrete conservation

Within 12-18h after concrete pouring, the concrete needs to be conserved, cooled and watered. Generally, water shall be sprinkled for conservation, and for overflow surface, dam crest and other special components, gunnysack shall be used for a cover and water is also sprinkled.

V Joint Grouting

The joint grouting is divided into 5 layers in a total, with each elevation of ¨Œ213, ¨Œ223,¨Œ237, ¨Œ251, ¨Œ265 and ¨Œ279m respectively, and there are 44 pouring regions. The design temperature is 13.5^{0}C.

The joint grouting shall adopt the pipe pulling-out method for its construction, that is, the air-filled plastic pipes shall be pre-embedded between the dam joints as to form some grouting loops, and the grouting shall be carried out in different sections.

Before grouting, the openness

of horizontal joint shall be measured and recorded by using a joint meter. In order to effectively control the openness increment of dam joint, the superficial joint meter shall be fixed downstream of the dam body before grouting. During the grouting process, any change on the superficial joint meter and the manometer shall be carefully watched on, and the pressure of vent pipe and the openness increment shall be strictly controlled, and meanwhile, water supply and pressure relief for the adjoining dam joint shall be prepared.

The joint grouting shall be undertaken layer by layer from downwards to upwards, and also extended from the dam middle to its both banks. The water-cement ratio adopts 3 grades such as 3:1, 1:1, 0.5:1, and grouting shall start from the ratio of 3:1, and after bleeding of the vent pipe, the 1:1 serosity shall be poured inside. When the bleeding concentration of vent pipe is close to 1:1 or when the pouring quantity of 1:1 serosity approximately equals to the joint dimension, the densest grade of 0.5:1 serosity shall be poured inside until the end. When finishing the pouring process, the sluice valve at the orifice shall be switched off firstly, and then the grouter is closed.

VI Erection of Observation Facilities

1. Installation of apparatus

Each apparatus which is to be embedded inside dam body, shall be acceptance-tested and stored strictly according to design requirements and other related standards, and each observation shall be made before, during and after the apparatus erection, and also the observed data shall be timely calculated and analyzed.

2. Construction of reversed hole

The reversed hole is very difficult to build and its construction needs to be highly accurate. Before and during the construction process, professionals shall be employed to offer instructions and inspect the construction accuracy at any moment, and in case of any deviation, it shall be rectified timely. The punching machinery shall adopt XU-300 oil-hydraulic geological borer. At the base-rock section, the drilling depth is 33.08m, thus meeting the requirement of 33m, and the effective hole-diameter is 153mm that also meet the requirement of 150mm. The pipe of reversed hole embedded inside dam shall be erected while the concrete pouring rises, and lofting shall be made for spot locating during its installation, and fixed with the turn-buckle drawing-pole. During pouring process, regular checks shall be undertaken, and in case of any deflexion, it need be adjusted timely as to ensure that the embedded accuracy meets the design requirement.

3. Construction of observation base-point

The installation & observation of observation base-point, check base-point and bench mark etc. inside dam body and outside dam shall all be undertaken in line with the requirements of design and standard, and the locations out of dam shall be reliable and stable, and try to be not affected by the stress inside dam area.

VII Construction Progress

The construction is started from April 18, 2003 officially, and till to 26 August 2003, test on the excavation of dam foundation is accepted, which is one month earlier than the planned. The excavation of soil and rock adds up to 43800m^3, with a monthly average of 10350m^3 and the maximum up to 15000m^3 in one month.

The concrete pouring starts from Sept. 9, 2003 for the dam body and the first critical target has been achieved on Feb. 29, 2004 on schedule—the dam body hits an elevation of 251m for flood control, as to guarantee its safe construction during the flooding season. On 22 June 2004, the second critical target is reached 3 days earlier than the plan—the dam body reaches the top elevation of overflow weir, 272m. On Sept. 16, 2004, the concrete pouring for dam body is completed half a month earlier, and that is to reach 279m, the elevation of dam crest. All the main works is finished on 22 October 2004. The concrete pouring amounts to 81000m^3, with an average of 6750m^3 per month and there are 6 months of pouring concrete over 7500m^3 successively, and the maximum is up to 11000m^3 in a month.

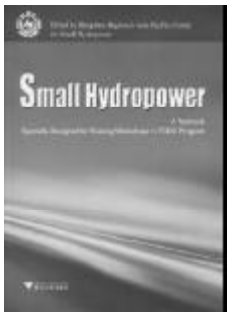
VIII Conclusions

During the construction of double-curvature concrete arch dam for Furong reservoir, its dam-foundation treatment, plane & vertical transport of concrete, shuttering, pouring and temperature control etc. are characterized in saving the cost, facilitating the construction management, improving the construction quality, shortening the construction term, and safeguarding the construction process, which can be taken as reference for similar projects.■

About author: *Li Zhiwu, Senior Engineer, director of international cooperation department, Hangzhou Regional Center (Asia & Pacific) for Small Hydro Power.*

Email: zwli@hrcshp.org

Small Hydropower——a text book specially designed for training workshop on TCDC program



This book is edited by HRC and sponsored by special publication fund of Nanjing Hydraulic Research Institute. It is prepared for the SHP training workshop of TCDC program. Till now, HRC has organized 42 workshops attended by more than 800 participants from about 80 countries, some of which have been sponsored by the UN organization while some others by Chinese government.

The main content of this book includes: general surveys, small hydropower exploitation and small river planning, hydrology and hydroenergy design, geologic problems in small hydro, civil works of small hydro, small hydraulic turbine and its auxiliary, electrical system of SHP, computer application in SHP stations, economic and financial appraisal, and appendix of five special topics.

We believe it would not only be valuable to the trainees in the future training workshop, but also be of reference to all SHP works over the world even including administrative persons and decision makers in the SHP field.

The price is 50 Yuan RMB. For more information, please contact Ms. Xuequn Shen through E-mail：xqshen@hrcshp.org ■

HRC's SHP Training Programs in 2008

No	Name of the Training	Date	Participants	Fee
1	2008 Training Workshop on Small Hydropower	15 May —23 Jun	From developing countries (to be held in English)	Fellowships are offered, including international airfares, boarding, lodging, local tranzportation, pocket money and etc. The interested applicants may contact, directly or through their governmental organization, the Commercial Office of the Chinese Embassy for approval.
2	2008 Training Workshop on Small Hydropower for Africa	14 Aug —23 Sept	African francophones (to be held in French)	

Application and Admission:

1) The applicants should be nominated by their governmental organizations. The nominated participants are requested to fill up the Participant's Information, and submit with valid Health Certificates provided by authorized physicians or hospitals to the Economic and Commercial Counselor's Office of the Chinese Embassy (ECCOCE) for examination, recommendation and endorsement;
2) After checking by the Economic and Commercial Counselor's Office of the Chinese Embassy, Admission Notices will be issued to the accepted participants by the ECCOCE through the related government departments of the participants. With the Admission Notices, the participants are requested to go through all necessary formalities for entering China and bring all the documents like Admission Notice, Participant's Information, Health certificates to China on the registration date.

The detailed information is now on HRC's homepage:www.hrcshp.org. In case of any assistance, please contact:Mr. Pan or Ms. Shen Xuequn,

HRC,122 Xueyuan Road, Hangzhou, P.R. China, 310012

Phone: 0086-571-56729285; 88086586

Fax:0086-571-88062934

E-Mail: hrc@hrcshp.org, xqshen@hrcshp.org ■

Annex

APPLICATION FORM
FOR CHINA TECHNICAL TRAINING COURSE
中国技术培训班（全称）学员申请表

I. Name of the training course:_____
Name of the course organizer:_____
Address:_____
Telephone: _____ Fax:_____

II.Personal Data

1.Last Name:_____
First Name:_____
2.Sex: ☐ male, ☐ female
3.Date of Birth:_____
4.Place of Birth:_____
5.Nationality: _____ 6.Religion:_____
7.Marital Status: _____
8.Health Condition: _____
9.History of Infectious Disease: ☐ No, ☐ Yes
If yes, please specify: _____
10.Mail address:_____
Phone:_____Fax:_____
E-mail:_____
11.Permanent address:_____
12.Person to be contacted in emergency:
Name: _____
Address:_____
Phone: _____ Fax: _____
E-mail:_____
13.Person to be contacted in China:
Name:_____
Address: _____
Phone:_____Fax:_____
E-mail _____
14.Statement of present work:
Name of institute: _____
Position: _____ Date of appointment: _____
Brief description of duties:_____
_____
15.Work experience: (Starting from current position)

Date	Position	Brief description of duties
_____	_____	_____
_____	_____	_____

16.Educational and/or professional qualifications:

Date	Level	Awarding Institution
_____	_____	_____
_____	_____	_____

17.Language Proficiency:
Mother Tongue: _____
English proficiency (Please tick):
Reading: ☐ excellent, ☐ good, ☐ fair, ☐ poor
Listening: ☐ excellent, ☐ good, ☐ fair, ☐ poor
Speaking: ☐ excellent, ☐ good, ☐ fair, ☐ poor
Writing: ☐ excellent, ☐ good, ☐ fair, ☐ poor
18.State why you plan to attend the course and indicate the practical use of the course for your future work..

III. Insurance

I fully understand that the course organizers do not take any responsibility for risks such as loss of life, accidents, illness, loss of property, theft etc.

IV. Personal Statement

I certify that I have answered the above questions truthfully and completely to the best of my knowledge. I agree to report any relevant alteration in the information given above.
I pledge to observe all the Chinese laws and regulations and will respect the local customs during my stay in China for the training course.

_____ Date:_____
Signature of Applicant

V. Endorsement and Recommendation of the Nominator

1.Name of Organization:_____
2.Recommendations:_____
Name(of person signing):_____
Name of Organization:_____
Position:_____
Signature or Official Seal:_____Date: _____